Abstracts

Determination of electromagnetic phased-array driving signals for hyperthermia based on a steady-state temperature criterion

M.E. Kowalski and Jian-Ming Jin. "Determination of electromagnetic phased-array driving signals for hyperthermia based on a steady-state temperature criterion." 2000 Transactions on Microwave Theory and Techniques 48.11 (Nov. 2000, Part I [T-MTT] (Mini-Special Issue on RF/Microwave Applications in Medicine)): 1864-1873.

Electromagnetic phased arrays can be used to preferentially heat tumors, potentially providing clinical benefit in oncological applications. Synthesizing a temperature field that exposes cancerous cells to sufficiently elevated temperatures, while not harming healthy cells is not a trivial problem, and can often be assisted by the use of computational models of the patient. In this paper, a method for determining phased-array driving signals that result in a clinically favorable temperature distribution is presented. It Is shown by example that simply focusing the power deposited over the tumor is not sufficient to guarantee that the peak temperature elevation occurs in the tumor in biological media. To remedy this, the temperature is predicted by a simple computational model and directly optimized as a function of the phased-array driving signals. To facilitate this optimization, superposition principles are used for both the electromagnetic and thermal models to minimize the number of computationally Intensive forward problems that must be solved.

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